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INTRODUCTION

It is known that children with Down syndrome (DS) present with delays in meeting developmental motor milestones. Without intervention, infants with DS initiate walking approximately one year later than their typically developing peers (TD).[5,6] It is understood that supine kicking in infants is an essential foundation for the development of walking due to similarities between the movement patterns. According to previous research, increased spontaneous kicking in TD infants is associated with an earlier onset of walking.[6] When comparing infants with DS to TD infants, the former produce a lower frequency of antigravity, high amplitude kicks.[5,6] The purpose of this study was to investigate the effects of a kick-toy intervention on the frequency of purposeful kicks in infants with DS as compared to data collected previously on TD infants using the same intervention. We hypothesized that the kick-toy intervention would increase the frequency of purposeful kicks in infants with DS, as was shown in the data for TD infants,[3] but to a lesser degree.

METHOD

Participants: Three infants with DS between the ages of 3 and 5 months participated in the study, compared to previously collected kicking data on five infants with typical development aged 3-5 months who followed the same intervention. This research study received University of Puget Sound IRB approval.
Inclusion criteria: DS and TD infants between the ages of 3 and 5 months.
Exclusion criteria: Infants with additional neuromuscular or developmental diagnoses including parent report of unresolved cardiac conditions, uncorrected hearing, and/or vision impairments.
Outcome measures: Frequency of kicks as defined by hip and knee flexion or hip and knee extension followed by reversal of the movement within one second.
Procedure: Researchers met with each participant and their family at 0 weeks and at 8 weeks of intervention. Participants and their families were given a Fisher-Price Finding Nemo Undersea Adventure Gym for at-home use and were instructed to use the kick-toy for 20 minutes a day, 5 days a week, for a duration of 8 weeks. Researchers collected and analyzed video kicking data with and without the toy from both of these meetings. Researchers then compared the data from infants with DS to data previously collected on TD infants utilizing the same intervention to determine the effects of the toy on the frequency of kicks between groups.

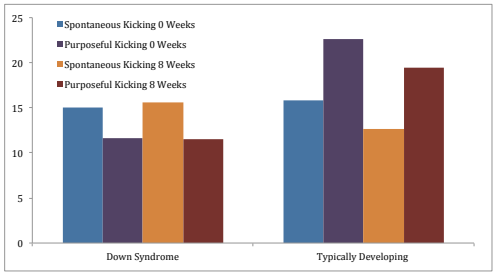

Figure 1. Average Spontaneous and Purposeful Kicks

Figure 2. Spontaneous Kicking and Purposeful Kicking

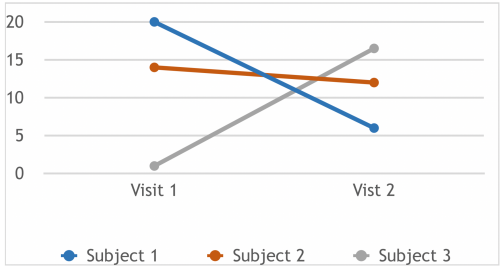

Figure 3. Number of Purposeful Kicks for Infants with Down Syndrome

RESULTS

For data collected at 0 and 8 weeks of the study, the mean number of spontaneous and purposeful kicks was 15.29 (SD 13.00) and 11.58 (SD 6.38), respectively for infants with DS and 14.20 (SD 13.70) and 21.00 (SD 19.20), respectively for TD infants. Visual inspection of this data indicates that the TD infants kicked more frequently with the kick-toy compared to without the kick-toy, whereas infants with DS did not demonstrate an increase in frequency of kicks with the kick-toy compared to without the kick-toy.

DISCUSSION

TD infants displayed a higher average frequency of purposeful kicking compared to spontaneous kicking at both 0 and 8 weeks of intervention. This indicates that the kick-toy intervention was useful for improving frequency of kicks while in use, but the intervention did not produce additional benefit from prolonged exposure for this population. For infants with DS, the average frequency of purposeful kicking was not greater than spontaneous kicking, suggesting that the intervention did not increase purposeful kicking on average for this group. For two out of three of these infants there was no increase in purposeful kicking over time, but one infant showed improvement. One of these infants began rolling during the 8 week visit, which could explain why there was no increase in purposeful kicking in supine for this infant.

TD infants and infants with DS produced a similar frequency of spontaneous kicks when comparing groups. This is consistent with previous research which states that although infants with DS produced a lower frequency of anti-gravity kicking than TD infants, the amount of spontaneous leg movement is similar.[5,6] The frequency of spontaneous kicks remained consistent for both groups throughout the course of the study indicating that the intervention did not improve frequency of kicking when the toy was absent.

CONCLUSION

Infants with DS did not show the same benefit of increased purposeful kicking that TD infants displayed at 0 and 8 weeks. Further studies should investigate the potential benefit of this intervention with increased exposure to the kick-toy, as infants with DS may need a treatment duration longer than 8 weeks to experience the same benefit. Future studies should also include a larger sample size of infants, as our study included only five TD infants and three infants with DS.

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